

USSN 10/521,546

2

**Listing of the Claims**

The claims are listed for the convenience of the Examiner. No amendments of the claims are presented.

1. **(Previously presented)** A control method for a fuel injection system having a spill valve, a nozzle control valve and a valve needle that is engageable with a seating to control fuel injection, the method comprising:

applying a first drive current signal to the spill valve so as to move the spill valve into a closed state;

applying a second drive current signal to the nozzle control valve so as to move the nozzle control valve to an open state, lift the valve needle from the seating, and initiate a main injection of fuel; and

modifying the first drive current signal applied to the spill valve so as to move the spill valve from the closed state to an open state during a spill valve opening period, followed by modifying the second drive current signal applied to the nozzle control valve so as to move the nozzle control valve from the open state to a closed state during the spill valve opening period, so as to urge the valve needle towards its seating and terminate the main injection of fuel.

2. **(Previously presented)** A control method as claimed in claim 1, further comprising:

switching the first drive current signal off to provide a first actuation pulse to initiate the spill valve opening period and

switching the first drive current signal on and then off again to provide a second actuation pulse prior to termination of the spill valve opening period.

USSN 10/521,546

3

3. **(Previously presented)** A control method as claimed in claim 2, further comprising:

monitoring a glitch detection signal indicative of spill valve opening and  
modifying the first drive current signal to provide the second actuation pulse at a time, relative to termination of the spill valve opening period, in dependence upon the glitch detection signal.

4. **(Previously presented)** A control method as claimed in claim 3, further comprising monitoring said glitch detection signal periodically during injection events.

5. **(Previously presented)** A control method as claimed in claim 1, wherein the first drive current signal is modified to cause the spill valve to move towards its open state at a time of between 0.05 and 2 milliseconds before a time at which the second drive current signal is modified to cause the nozzle control valve to move towards its closed state.

6. **(Previously presented)** A control method as claimed in claim 5, wherein the first drive current signal is modified between 0.1 and 1 millisecond before the second drive current signal is modified.

7. **(Previously presented)** A control method as claimed in claims 1, wherein the second drive current signal is switched on to move the nozzle control valve to its open state.

USSN 10/521,546

4

8. **(Previously presented)** A control method as claimed in claims 1, wherein the second drive current signal is switched off to move the nozzle control valve to its open state.

9. **(Previously presented)** A control method for delivering a main injection of fuel followed by a post injection of fuel, the method comprising:

actuating a spill valve and a nozzle control valve to initiate the main injection of fuel, terminating the main injection of fuel by (i) actuating the spill valve at a first time to cause the spill valve to move to an open state followed by (ii) actuating a nozzle control valve at a second time to cause the nozzle control valve to move into a closed state,

subsequently actuating the spill valve at a third time to cause the spill valve to move from its open state to a closed state, and

initiating the post injection of fuel by actuating the nozzle control valve to move into an open state, whereby the difference between the first and third times is selected to provide a relatively high pressure post injection of fuel so as to reduce smoke emissions levels.

10. **(Previously presented)** A control method as claimed in claim 9, wherein the spill valve is actuated to move between its open and closed states by modifying a spill valve drive current signal.

11. **(Previously presented)** A control method as claimed in claim 10, wherein the relative timing between opening and closure of the spill valve is selected to ensure the post injection pressure is at least 1700 bar.

USSN 10/521,546

5

12. **(Previously presented)** A control method as claimed in claim 11, wherein the relative timing between opening and closure of the spill valve is selected to ensure the post injection pressure is at least 2000 bar.